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SHIGELLA SURVEILLANCE

FIRST QUARTER 1965

Report No. 6
43 Participating States

PREFACE

This report summarizes data voluntarily reported from various states, territorial and city, Health Departments. Much of the information is preliminary.

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Introduction

Forty-six reporting centers are now participating in the Shigella Surveillance Program. These include 43 states as well as New York City, the District of Columbia, and the Virgin Islands (Figure 1). We are happy to welcome Michigan, which started reporting April 1, to the Shigella Surveillance Program.

I Summary of the First Quarter

A total of 1,752 shigella isolations were reported from 43 states and three other reporting centers during the first quarter of 1965. This represents a decline from the 2,101 isolations reported from the same reporting centers during the fourth quarter of 1964. Almost 70 per cent of shigella isolations were reported from children under 10 years of age. As in previous periods, a slightly larger percentage of isolations were reported from females than from males, being most marked in women over 20 years of age. More isolations from males than from females was again noted in children under 5 years of age. The most frequently isolated serotypes during the first quarter continues to be Shigella sonnei and S. flexneri 2a. All S. boydii and S. dysenteriae are rare. In northern states S. sonnei was more frequently reported than all S. flexneri serotypes combined, while in southern states the S. flexneri group predominated.

II Current Morbidity Trends

A. Season (Figure 2)

Seventeen states have been reporting shigella isolations since January 1964. As indicated in previous reports, these isolations showed a marked seasonal increase beginning in July and peaking in September, at which time the isolations were approximately double the reported isolations of the winter (Figure 2). Since many shigella isolations are reported a month or two after the onset of illness, it is probable that the curve in Figure 2 should be shifted back by this interval to accurately represent the seasonal pattern of the disease. The isolations reported from these states during the first three months of 1965 show a similar level to that seen during the same period of 1964, again confirming the impression of winter endemicity. It should be noted that Figure 2 in this report has been constructed on the basis of average weekly isolations rather than by total monthly isolations as in previous reports. Since some months have five reporting weeks while most have four, this new graphical form gives a more accurate representation of the seasonal pattern of reported shigella isolations, though the curve remains essentially the same.

B. Age (Figure 3 and Table III)

Shigella isolations reported during the first quarter of 1965 show an age distribution similar to that of previous quarters (Figure 3 and Table III). Approximately 70 per cent of isolations are reported from children under 10 years of age. Of these, approximately 12 per cent are reported from children under 1 year of age, a slightly higher percentage than has been reported during previous quarters. For the first time, the data has been analyzed to compare isolations reported from children in the first and second six months of age. During this quarter approximately equal numbers of isolations were reported from children in the first and second six months of age. Analysis of isolations reported from infants prior to 1965, however, shows a slightly greater number from infants in the first six months of age.

C. Sex (Table IV)

Of the 1,752 isolations reported during the first quarter of 1965, 1,520 were identified by sex. Of these 1,520 isolations, 744 (51.0 per cent) were from females. Though this difference is slight it is in accord with the data of previous quarters. Table IV analyzes this pattern by age group, and again shows a pattern similar to that reported before. From this table it can be seen that the over-all female dominance is accounted for by the markedly higher reported isolations in women over the age of 20 (64 per cent). In children under 4 years of age the pattern is reversed, with males accounting for a greater percentage of reported isolations. This is most marked in infants less than six months of age (61 per cent). Between 5 and 19 years of age isolations from males and females are about equal. It is not known whether this unexpected sex distribution of reported isolations truly reflects that of the disease, or some unknown bias in the surveillance system. Male dominance in infants and small children has been reported for other infectious diseases.

D. Serotype Frequencies (Table I)

1. Data from First Quarter 1965

During the first quarter of 1965, 16 shigella serotypes were reported from 46 reporting centers. No single serotype was reported from all 46 centers. The most frequently isolated serotype was S. sonnei. Of the 1,752 reported isolations, 722 or 41.2 per cent were due to S. sonnei. During the previous quarter there were 817 S. sonnei isolations accounting for 38.9 per cent of reported isolations. Shigella sonnei has been the most frequently isolated single serotype in all previous quarters except the third quarter of 1964, when it ran a close second to S. flexneri 2. These observations support the concept that there is more seasonal variation in the S. flexneri groups than with S. sonnei. The six most frequently isolated serotypes during the first quarter of 1965 are illustrated in the following table (note that Shigella flexneri subgroups have been combined into the major numbered subgroups for comparative purposes since all states do not perform this final serotyping):

First Quarter 1965				Previous Quarter	
Rank	Serotype	Number	Per cent	Rank	Per cent
1	S. sonnei	722	41.2	1	38.9
2	S. flexneri 2	375	21.4	2	21.0
3	S. flexneri 3	159	9.1	4	7.6
4	S. flexneri 4	97	5.5	5	4.4
5	S. flexneri 6	84	4.8	3	8.5
6	S. flexneri 1	54	3.1	6	3.0
			85.1		83.4

In all previous quarters these six serotypes have been the six commonest groups, and account for over 80 per cent of all isolations. Shigella sonnei and S. flexneri 2 are always the two commonest groups. Positions three through six are always occupied by S. flexneri 1, 3, 4, and 6, with the order varying from quarter to quarter. Shigella flexneri 5 and all members of the S. dysenteriae and S. boydii groups are rare.

2. Accumulative Data (Table II)

In Table II all reported shigella isolations since the onset of the surveillance program are tabulated. A total of 8,711 isolations were reported during this 18 month period, 8,627 of which were typed at least as far as a main group (A, B, C, or D). Many of these were not completely typed, however. In Table II the isolations in each of the unspecified categories have been distributed in their subgroups in the same proportion as the completely specified isolations of that group. These figures on Table II are called the "calculated number" and from these are derived a "calculated frequency" for each serotype. This probably gives a reasonably accurate approximation of the relative frequencies of at least the commoner shigella serotypes in the United States. From Table II the six commonest serotypes are:

Rank	Serotype	Frequency (Per cent)
1	S. sonnei	39.8
2	S. flexneri 2a	23.0
3	S. flexneri 3a	9.0
4	S. flexneri 2b	6.6
4	S. flexneri 6	6.6
6	S. flexneri 4a	4.8
Total		89.8

Thus, it can be seen that the six commonest serotypes account for almost 90 per cent of all isolations, and that these serotypes are all either S. sonnei or in the S. flexneri group. It should also be noted, however, that a number of S. flexneri serotypes are unusual or rare, as are all S. boydii and S. dysenteriae serotypes.

E. Serotype Distribution by Region (Figures 1, 4 and 5)

As has been noted in past surveillance reports, a marked regional difference exists in the shigella serotypes reported from northern and southern states, without a corresponding difference existing between East and West. These regions have been defined arbitrarily as shown in Figure 1. In the southern states S. flexneri serotypes (all group B serotypes combined) have accounted for about 75 per cent of all reported isolations, while in northern states the S. flexneri group has accounted for 40 to 50 per cent of isolations (Figure 4). In North and South, S. flexneri isolations show a more marked seasonal fluctuation than do the reported S. sonnei isolations. Thus, because the S. flexneri group is more common in the South the seasonal fluctuation is greater in this region (Figure 5).

The isolations reported during the first quarter of 1965 continue in more or less the pattern described above. In both North and South the S. flexneri group accounted for a somewhat greater proportion of isolations than they did during the same three months of 1964. In the South this is explained by an actual increase in the number of S. flexneri isolations during January and February (Figure 5). As has been true in the past, no difference in ratio of these serotypes exists between East and West. It should be noted that Figures 4 and 5, are constructed from the isolations reported from only 15 states. This has been done for the sake of comparison with 1964, since only 17 states were reporting in January 1964. Two states, Hawaii and Alaska were reporting in January 1964, but are not included in Figures 4 and 5. They are not contiguous with the rest of the states, and are probably subject to different influences. It is of interest that neither of these states fit the North-South pattern. Even though only 15 states have been used for the

construction of Figures 4 and 5, data for all reporting centers gives essentially the same results.

F. Family Associated Isolations

Of the 1,752 isolations reported during the first quarter of 1965, 397 (22.5 per cent) represented those who also had other members of their family positive for shigella. This ratio is similar to that reported during previous quarters, and is higher than that reported for salmonellae. (18.1 per cent of 1963 salmonella isolations were family associated).

G. Nonhuman Isolations

One nonhuman shigella isolation, from a monkey, was reported during the first quarter of 1965. Reports of nonhuman shigella isolations are unusual, and are almost always from primates.

III Reports of Outbreaks from the States

A. Waterborne Outbreak of Gastroenteritis Due to Shigella sonnei at a Restaurant

Dr. Ralph H. Heeren, Director, Division of Preventable Diseases, Iowa Department of Health

On January 5, 1965, the first of several hundred cases of gastroenteritis due to Shigella sonnei occurred primarily among adult residents of an Iowa town, with a population of about 6,000. The illness was characterized by varying degrees of fever, diarrhea, nausea, headache, and weakness. Fever usually ranged from 102 degrees F to 104 degrees F. A total of 13 cases required hospitalization; there were no deaths. Duration of illness varied from 1 to 7 days.

The first cases occurred on January 5 among students in the local college (enrollment about 1,400) who had returned from Christmas vacation on January 3 and 4. Over the next several days more cases occurred among college students and townspeople, with a maximum incidence between January 11 and 13. In all some 200 to 300 cases occurred. The occurrence of cases primarily among adults, over a short period of time, suggested a common source epidemic. A survey revealed that the only exposure these patients had in common was at a local restaurant on the outskirts of town. Furthermore, between January 8 and 10 so many restaurant employees were suffering from gastroenteritis that they had difficulty maintaining service. The attack rate among college students who had eaten at this restaurant was 69 per cent (67 of 96). Food histories on several groups failed to reveal any common food item. For example, of one group of four college students who had an afternoon snack at the restaurant, two ate ice cream, one had a bottled drink, and one had coffee. All but the latter had water and only these three became ill.

Of the stool specimens obtained from cases, nine were positive for S. sonnei. Of these nine, four were employed at the suspect restaurant. Shigella sonnei was also isolated from the stool of a Minnesota college student after returning from a visit to the town where the outbreak had occurred. He had also eaten at the implicated restaurant.

Inspection of the restaurant revealed that this establishment was located on limestone bluffs outside the city. Because of the location, the restaurant depended on wells for water and septic tanks for sewage disposal. The limestone in that area is known to have many faults and fissures. Examination of water specimens on two occasions in January gave high coliform counts, but shigella organisms were not recovered.

Histories from restaurant employees revealed that two had suffered from periodic bouts of diarrhea during late November and December, 1964. It is hypothesized that these people may have been the source of contamination of the water through seepage from the septic tanks.

Editor's Comment: Reported outbreaks of water-borne shigellosis are now infrequent. When they do occur, they are now usually due to inadequate private water and sewage systems. Often such outbreaks are preceded by a dry period and then heavy rain, or rapidly melting snow. It would be of interest to know if such climatic conditions might have contributed to the obviously marked contamination of the water in this outbreak. The failure to recover the shigella organisms from the water samples is not surprising. Isolation of shigella organisms from water is very unusual even from outbreaks where the epidemiology leaves little room for doubt as to the vehicle. This is true probably because even when water is heavily contaminated it remains so only for a short period of time, which then disappears by the time the investigation reaches the point of sampling the water. As in this case, however, high coliform counts may persist for some time after the incriminated organisms have disappeared.

B. Outbreak of Gastroenteritis Due to Shigella sonnei in a Community Hospital and College - Preliminary Report

Dr. I. F. Gratch, In Charge of Epidemiology Section, Pennsylvania State Department of Health

On January 26, a 17 year old student developed gastroenteritis and was admitted to the hospital serving a town of 6,000. Over the next 5 weeks, 19 similar cases developed among the 315 hospital employees. These cases were generally mild and characterized by moderate fever, abdominal pain, diarrhea, and nausea.

Between February 11 and 23, approximately 180 students at the university in a nearby town came down with mild gastroenteritis similar to that described for the hospital employees. All of these 180 cases were among the 1871 students who ate at one of four dining halls. During the week preceding the outbreak 12 kitchen employees in this dining hall had been on sick leave with gastroenteritis. These kitchen employees lived in the first town where the involved hospital is located and were members of the families of the hospital employees who were ill.

The state health department did not receive notification of this outbreak until late in February. Beginning early in March stool specimens were obtained for culture. Three specimens among 25 hospital cases and their contacts were positive for Shigella sonnei. None of the university kitchen employees were harboring pathogenic organisms. One of 77 stool specimens from past cases at the university was positive for S. sonnei. Results from blood specimens obtained for hemagglutination inhibition tests are not yet available.

It is hypothesized that an outbreak of gastroenteritis due to S. sonnei arose in the community in which the hospital is located and spread by person-to-person contact to the hospital employees and university kitchen employees. The kitchen employees are considered to then have caused a food-borne outbreak at the university.

Editor's Comment: The low recovery rate of the hypothesized organism leaves some doubt as to the etiology of the outbreak. However, the duration of the convalescent carrier state has not been studied sufficiently to accurately judge what percentage of patients will have positive stool cultures at various intervals after recovery. The occurrence of fever amongst the cases, in particular, supports the concept of a bacterial epidemic. A recovery of only one pathogen even at a low rate, makes this the likely pathogen. The outbreak typifies the difference between the slow spread and low attack rates usually seen in a person-to-person outbreak, in comparison with the occurrence of cases over a short period and in greater numbers, in a food-borne outbreak. It is surprising that there were no secondary cases among patients in the hospital, considering the rather extensive spread among the employees. Food histories from students in the involved dining hall might have provided interesting information as to which food or foods were responsible.

TABLE I
SHIGELLA SEROTYPES ISOLATED FROM HUMANS
FIRST QUARTER, 1965

NORTHEAST

SEROTYPE	Conn	Del	DC	Ill	Ind	Iowa	Ken	Me	Md	Mo	NH	NJ	NYC	Ohio	Pa	RI	Vt	Va	WVa	Wisc	Northeast Total
A. S. dysenteriae																					
1																					
2				1																	1
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
unspecified																					
B. S. flexneri																					
1a				1																	1
1b																					
1 unspecified				1											1						2
2a				30											2						32
2b																					
2 unspecified									8					9							17
3a																					
3b																					
3c																					
3 unspecified				12					5					2							19
4a				2																	2
4b	1																				1
4 unspecified																					
5				1																	1
6				5					1												6
variant y																					
unspecified		5			3		1			2	5		70					11		7	104
C. S. boydii																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					
13																					
14																					
15																					
unspecified																					
D. S. sonnei	11		1	20	5	202	1	1	16	2		1	29	25	7	4		4		37	366
untypable																					
unknown			14										4							7	25
Total	12	5	15	73	8	202	2	1	30	4	5	1	103	36	10	4	0	15	0	51	577

NORTHWEST / SOUTHEAST

SEROTYPE	Col	Ida	Kan	Mont	Nev	ND	Ore	SD	Utah	Wash	Wyo	Northwest Total	North Total	Ala	Ark	Fla	Ga	La	Miss	NC	Tenn	Southeast Total
A. S. dysenteriae																						
1																						
2													1								2	2
3	1											1	1								1	1
4																						
5																						
6																						
7																						
8																						
9																						
10																						
unspecified																				4		4
B. S. flexneri																						
1a	2		1	10								13	14									
1b	2											2	2									
1 unspecified	2									5		7	9			3	1				4	8
2a	4		3	2		1						10	42		1			17				18
2b				1								1	1		1			2				3
2 unspecified	1									18		19	36		2	53	27		1		55	138
3a															3			7				10
3b																						
3c																		4				4
3 unspecified													19		2	26	7				24	59
4a	3		1	2								6	8		2			3				5
4b													1									
4 unspecified															1	4	2		1		11	19
5	1											1	2			1						1
6	2		2							1		5	11			4	19	3			14	40
variant y																						
unspecified							5	9				14	118	5					14	16		35
C. S. boydii																						
1																						
2	2											2	2					1			5	6
3																						
4																						
5																						
6	1											1	1									
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						
unspecified	1							1				2	2									
D. S. sonnei	36	8	17				27		15	36		139	505	5		39	36	19		16	23	138
untypable				1								1	1									
unknown											1	1	26						2			2
Total	58	8	24	16	0	1	32	10	15	60	1	225	802	10	12	130	92	56	18	36	139	493

SOUTHWEST / OTHER

SEROTYPE	Ariz	NM	Okla	Tex	Southwest Total	South Total	Alas	Haw	VI	Other Total	Grand Total	Frequency	Frequency Previous Quarter	*1964 CDC Total	*1964 CDC Frequency	SEROTYPE
A. S. dysenteriae												0.6	0.4			A. S. dysenteriae
1														6	0.9	1
2						2					3	0.2	0.1	6	0.9	2
3				1	1	2			1	1	4	0.2				3
4																4
5																5
6																6
7																7
8																8
9																9
10																10
unspecified						4					4	0.2	0.3			unspecified
B. S. flexneri												55.3	57.5			B. S. flexneri
1a	6				6	6					20	1.1	1.4	89	12.8	1a
1b	4				4	4		1		1	7	0.4	0.9	14	2.0	1b
1 unspecified	2			8	10	18					27	1.5	0.7			1 unspecified
2a	13				13	31		13		13	86	4.9	4.9	180	25.9	2a
2b	2	26	8		36	39	1			1	41	2.3	2.2	71	10.2	2b
2 unspecified				68	68	206			6	6	248	14.2	13.8	2	0.3	2 unspecified
3a						10					10	0.6	1.4	43	6.2	3a
3b														6	0.9	3b
3c						4	6			6	10	0.6	0.2	16	2.3	3c
3 unspecified	3	26		20	49	108	2	4	6	12	139	7.9	6.0			3 unspecified
4a	7		3		10	15		4		4	27	1.5	1.2	99	14.2	4a
4b	5				5	5					6	0.3		5	0.7	4b
4 unspecified		9		36	45	64					64	3.7	3.1	2	0.3	4 unspecified
5		1			1	2					4	0.2	0.2	4	0.6	5
6	11	5		14	30	70	3			3	84	4.8	8.5	57	8.2	6
variant y							15			15	15	0.9	0.1	5	0.7	variant y
unspecified	1	2	23		26	61	3			3	182	10.4	12.9	4	0.6	unspecified
C. S. boydii												1.2	0.8			C. S. boydii
1														2	0.3	1
2	2	1			3	9					11	0.6	0.4	9	1.3	2
3																3
4														1	0.1	4
5																5
6											1	0.1				6
7																7
8																8
9																9
10																10
11																11
12																12
13																13
14																14
15																15
unspecified		5			5	5		1		1	8	0.5	0.4	1	0.1	unspecified
D. S. sonnei	5	4	3	29	41	179		38		38	722	41.2 41.2	38.9 38.9	74	10.6	D. S. sonnei
untypable											1	0.1				untypable
unknown						2					28	1.6	2.1			unknown
Total	61	79	37	176	353	846	30	61	13	104	1,752			696		Total

* Shigella cultures examined by CDC Enteric Bacteriology Unit, 1964

TABLE II

CUMULATIVE SHIGELLA SEROTYPE FREQUENCIES
Based on all Isolations Reported From Fourth Quarter 1963 Through First Quarter 1965

	Number Reported	*Calculated Number	*Calculated Frequency	Rank
A. S. dysenteriae**				
1				
2	21	30	0.3	13
3	7	10	0.1	16
4				
5				
6	1	1	0	19
unspecified	12			
B. S. flexneri				
1a	56	194	2.2	8
1b	44	152	1.8	9
1 unspecified	183			
2a	445	1988	23.0	2
2b	128	570	6.6	4
2 unspecified	1509			
3a	71	776	9.0	3
3b	3	33	0.4	12
3c	24	263	3.0	7
3 unspecified	775			
4a	100	418	4.8	6
4b	18	76	0.9	10
4 unspecified	284			
5	17	20	0.2	14
6	462	570	6.6	4
variant y	17	20	0.2	14
unspecified	944			
C. S. boydii**				
1				
2	31	64	0.7	11
3				
4	3	6	0.1	17
5				
6	1	2	0	18
unspecified	37			
D. S. sonnei	3434	3434	39.8	1
Untypable	1			
Unknown	83			
Total	8711	8627		

* Calculated Number and Frequencies are derived by applying the unspecified isolations in each group to that group in the same proportion as the known isolations of that group.

** Group A serotypes 7-10 and Group C serotypes 7-15 were not reported during this period.

TABLE III

AGE AND SEX DISTRIBUTION OF 1752 ISOLATIONS OF SHIGELLA

REPORTED FOR THE FIRST QUARTER OF 1965

Age Group	Male	Female	Unknown	Total	Per cent of Subtotal	Per cent in Previous Quarter
0-6 mos	38	24	5	67	6.4	9.9 under 1 yr
7-12 mos	37	28	0	65	6.2	
1-4 yrs	210	170	1	381	36.1	35.2
5-9 yrs	109	102		211	20.0	22.1
10-19 yrs	64	63		127	12.1	12.6
20-29 yrs	27	57		84	8.0	8.2
30-39 yrs	18	35		53	5.0	4.3
40-49 yrs	6	14		20	1.9	2.5
50-59 yrs	4	12		16	1.5	2.5
60-69 yrs	5	12		17	1.6	1.5
70-79 yrs	3	8		11	1.0	0.9
80+ yrs	1	2		3	0.3	0.5
Subtotal	522	527	6	1055		
Unknown	224	247	226	697		
Total	746	774	232	1752		
Per cent of total (minus unknown)		49.4	50.6			
Per cent in Previous Quarter		49.2	50.8			

TABLE IV

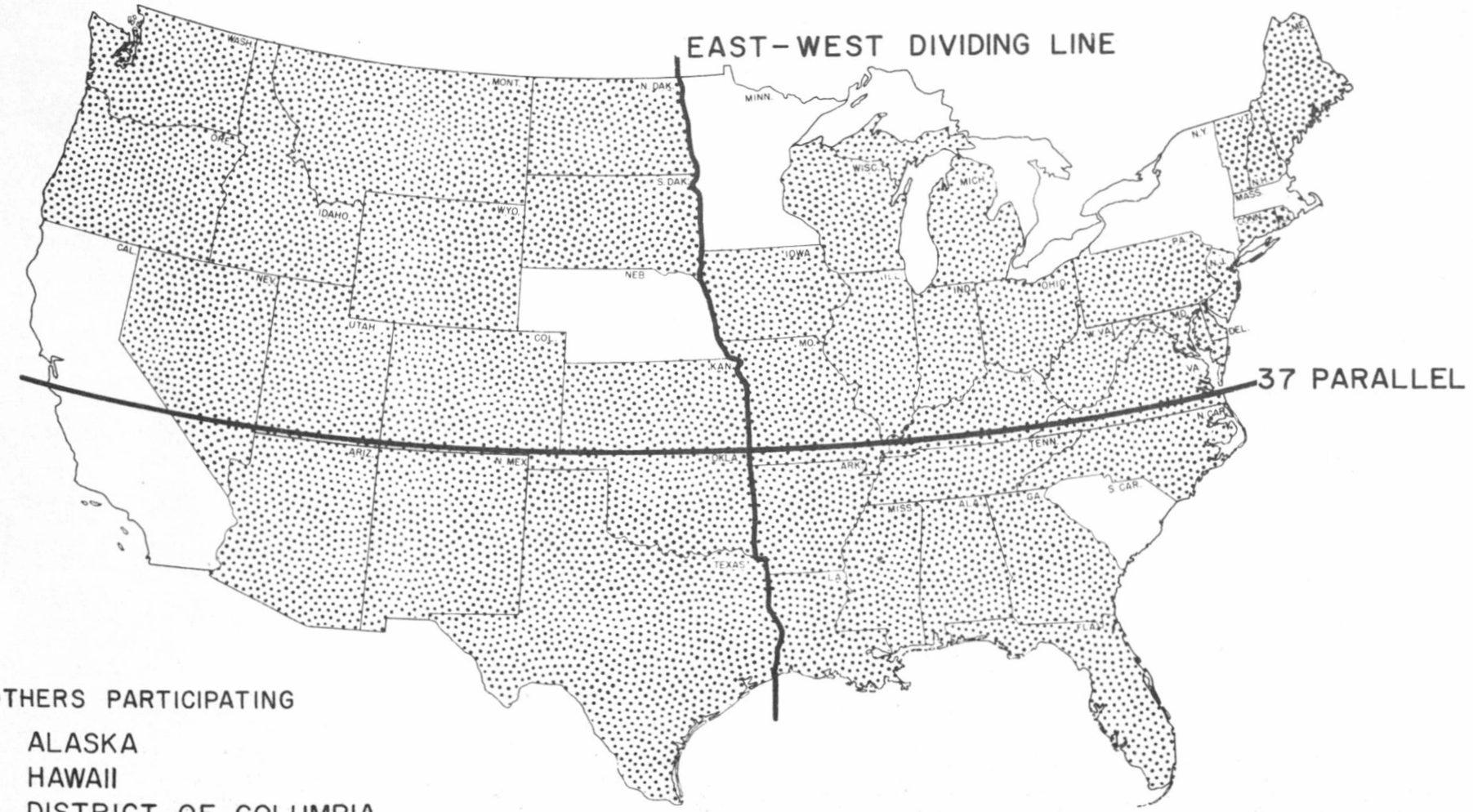
SHIGELLA ISOLATIONS BY SEX AND AGE GROUP

First Quarter 1965

Age group	Male		Female		Total
	Number	Per cent	Number	Per cent	
0-6 months	38	61.3	24	38.7	62
7-12 months	37	56.9	28	43.1	65
1-4 years	210	55.3	170	44.7	380
5-9 years	109	51.7	102	48.3	211
10-19 years	64	50.3	63	49.7	127
20-49 years	51	32.5	106	67.5	157
50+ years	13	27.6	34	72.4	47
Subtotal	522	49.7	527	50.3	1049
Unknown age	224	47.5	247	52.5	471
Total	746	49.0	774	51.0	1520

Figure I.

STATES CURRENTLY PARTICIPATING IN SHIGELLA SURVEILLANCE*



*OTHERS PARTICIPATING

ALASKA
HAWAII
DISTRICT OF COLUMBIA
NEW YORK CITY
VIRGIN ISLANDS

Figure 2.

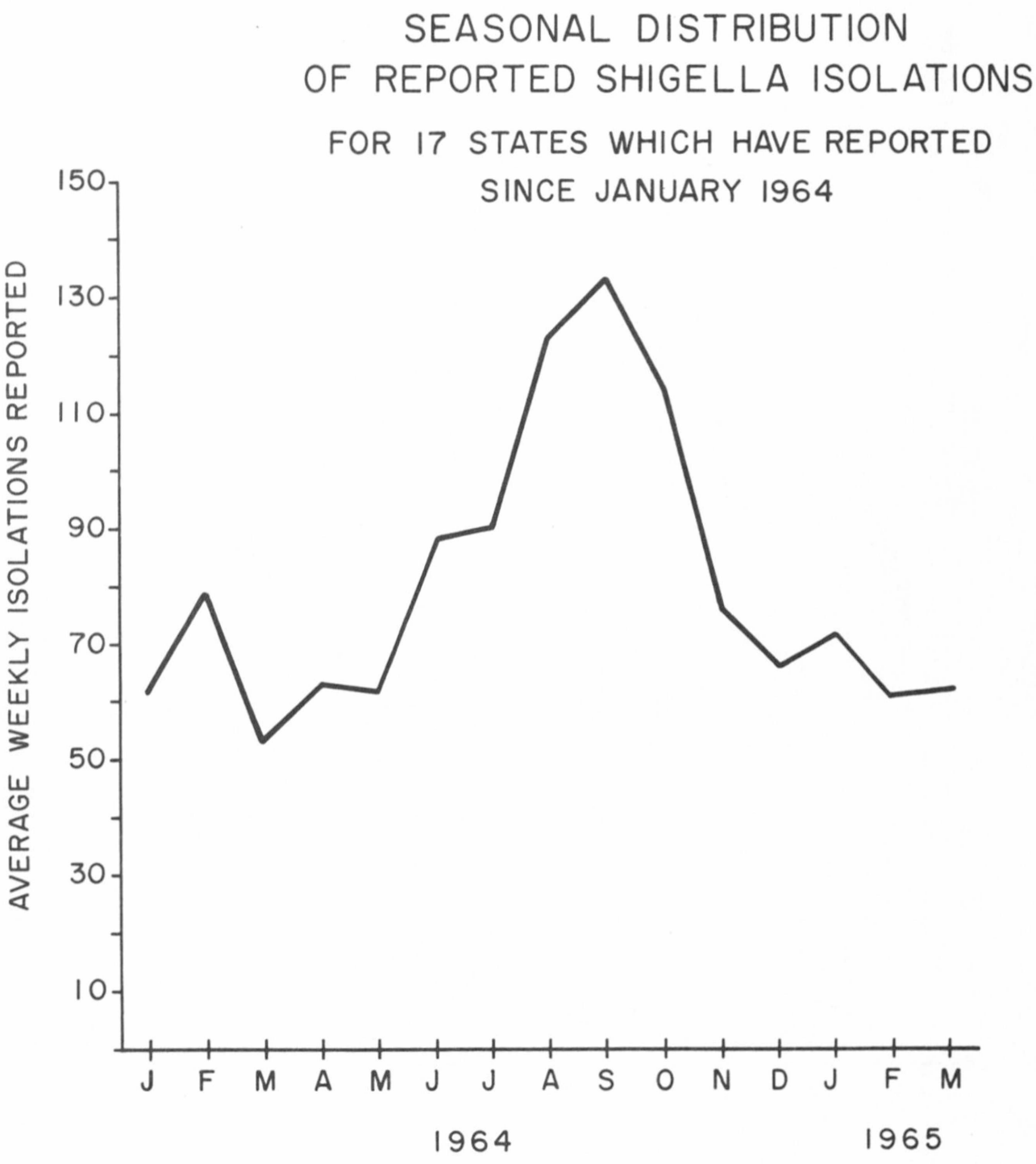
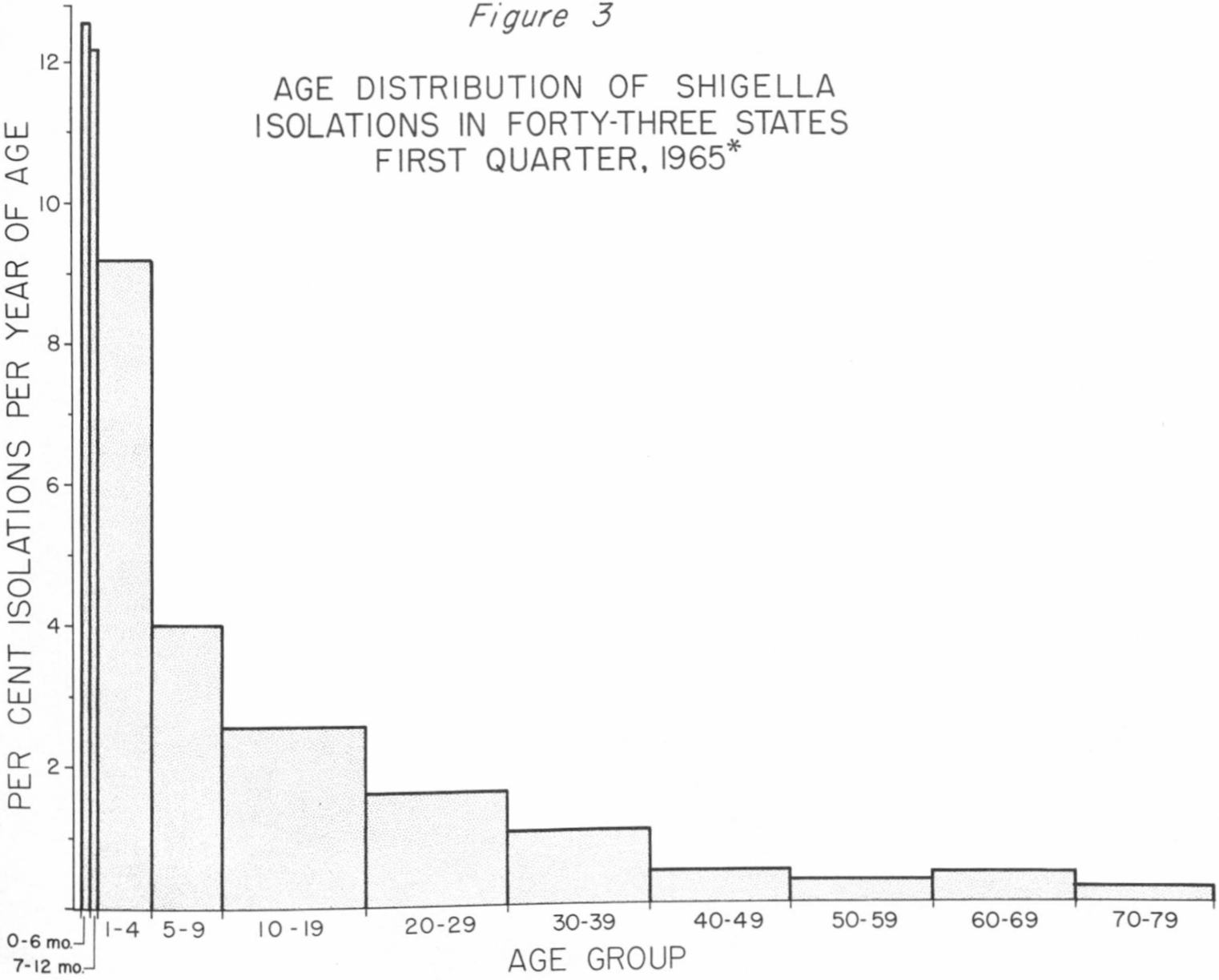

SEASONAL DISTRIBUTION
OF REPORTED SHIGELLA ISOLATIONS
FOR 17 STATES WHICH HAVE REPORTED
SINCE JANUARY 1964
AVERAGE WEEKLY ISOLATIONS REPORTED
150
130
110
90
70
50
30
10
J F M A M J J A S O N D J F M
1964
1965

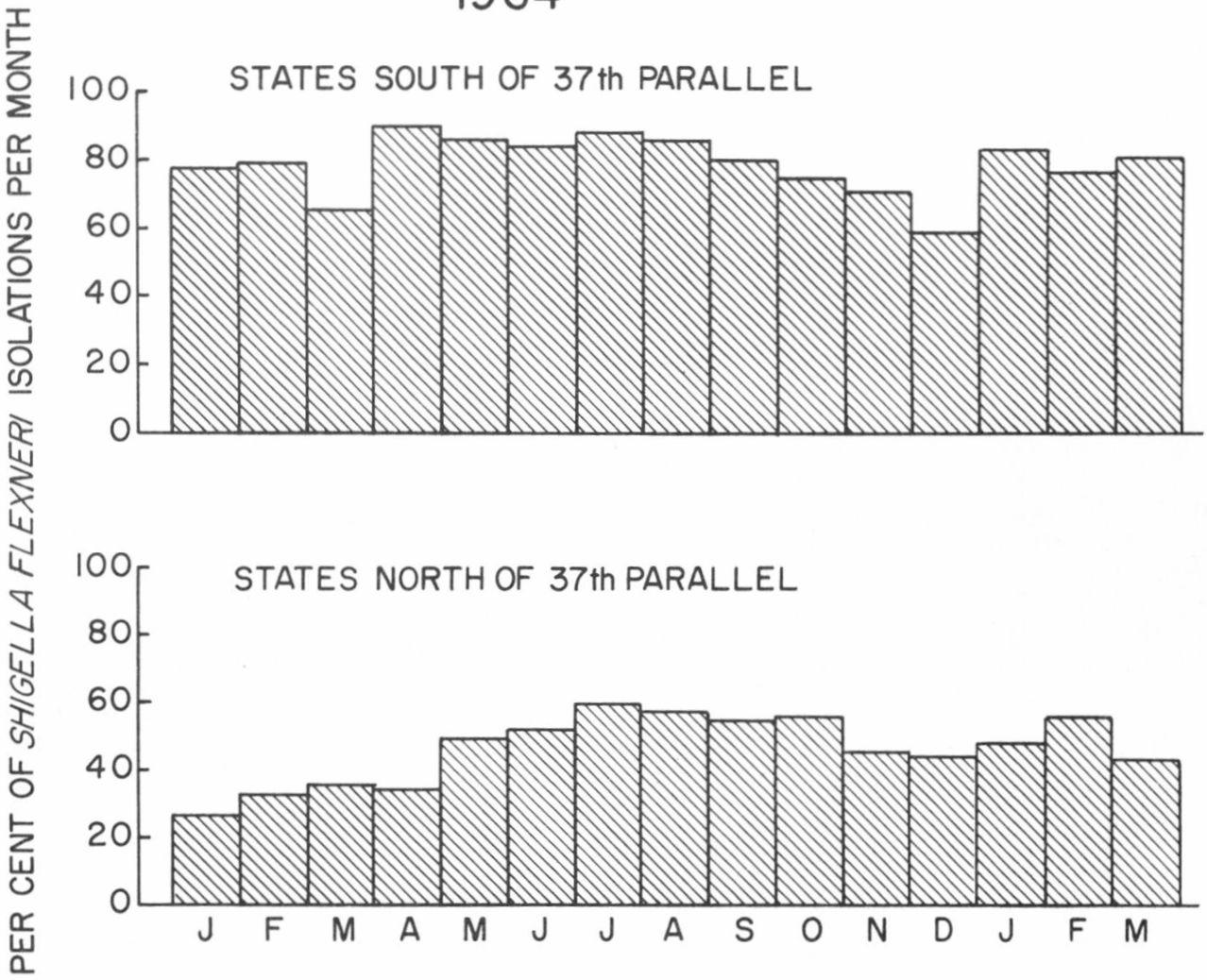
Figure 3



*FOR 1055 ISOLATIONS IN WHICH AGE WAS REPORTED; IN 697 AGE WAS NOT REPORTED

Figure 4.

REGIONAL DISTRIBUTION OF SHIGELLA SEROTYPES FROM 15 STATES* WHICH HAVE REPORTED SINCE JANUARY 1964

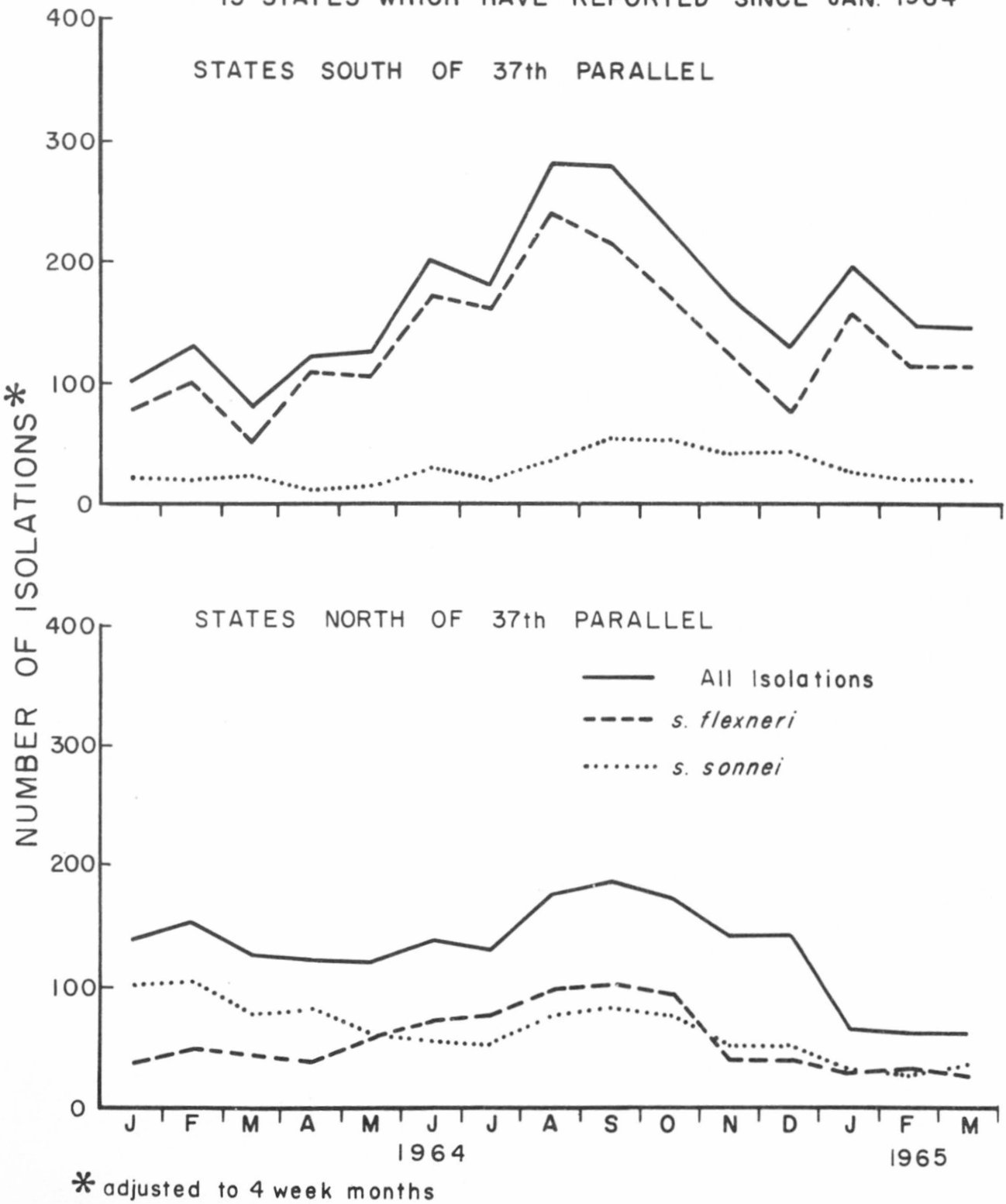


*Alaska and Hawaii also reported during this period but are not included on graph as explained in text.

Figure 5

SEASONAL DISTRIBUTION OF SHIGELLA ISOLATIONS BY SEROTYPE AND REGION

15 STATES WHICH HAVE REPORTED SINCE JAN. 1964



* adjusted to 4 week months